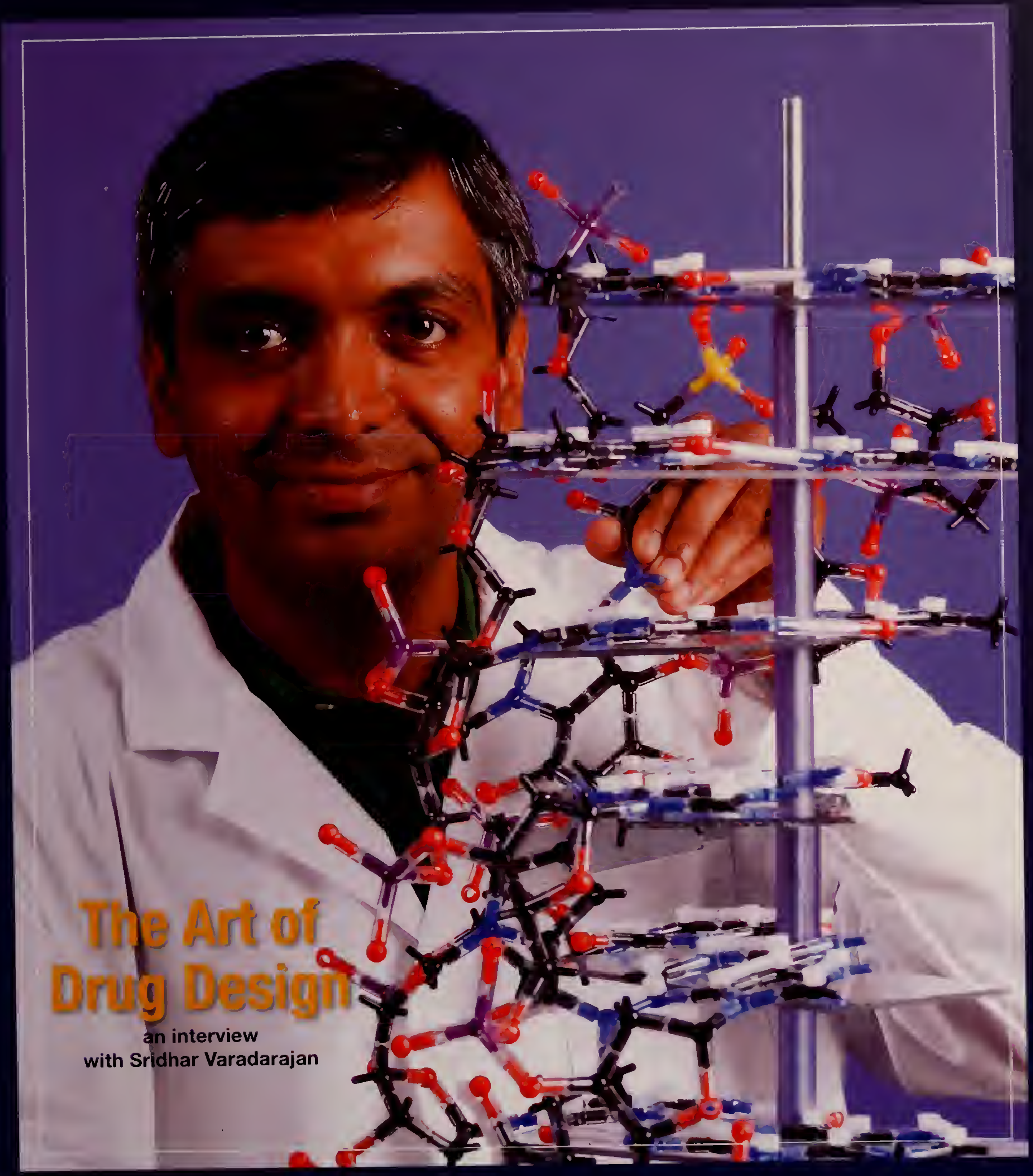

The Art of Drug Design

an interview
with Sridhar Varadarajan

Arts & Sciences

The Magazine of the **College of Arts & Sciences** at the University of North Carolina **Wilmington**

Annual **2005-06**

LETTER FROM THE DEAN

"The arts and sciences are the heart and soul of a university." We hear this statement and others like it often on campuses like UNCW's where a large, comprehensive arts and sciences college comprises most of the university. But what does the statement actually mean?

We might think of it this way: It's the job of the College of Arts and Sciences to ensure that a liberal arts education is the foundation of every student's experience at UNCW, whether or not he or she chooses a major within the college. By "liberal arts education" we mean an understanding of the physical world, the social world and the human condition - essential preparation for life in the 21st century. An education with this focus sets the stage for a meaningful life and develops the thinking, communication and collaborative skills necessary for rewarding work.

Chancellor DePaolo welcomes Dean Cordle at the 2005 August Faculty Meeting, opening the academic year.

The College of Arts and Sciences at UNCW accomplishes this educational goal through the involvement of students and faculty in four areas:

THE ARTS art and art history, creative writing, film studies, music, theatre

THE HUMANITIES English, foreign languages and literatures, history, liberal studies, philosophy and religion

THE SCIENCES biology and marine biology, chemistry and biochemistry, computer science, earth sciences, environmental studies, mathematics and statistics, physics and physical oceanography

THE SOCIAL SCIENCES anthropology, communication studies, gerontology, health and applied human sciences, political science, psychology, sociology and criminal justice, social work

This issue of the College of Arts and Sciences magazine is dedicated to the sciences. It celebrates our scientific achievements by highlighting personal stories. UNCW's science programs are historically strong. Their reputation is based on first-rate teaching, cutting-edge research and real-world contributions that advance the quality of life in this region and beyond.

We are pleased to present an interview with Dr. Sridhar Varadarajan, who seeks new mechanisms for the treatment and cure of diseases such as cancer through his drug design research; a feature on Charles White, a student whose intellectual curiosity spans four disciplines of science, as well as Spanish language and culture; the story of a geological expedition to a lost city, entombed in ash and pumice since the eruption of the Tambora volcano in 1815; a report on what marine organisms can tell us about muscle physiology in humans; and profiles of some of UNCW's women in science.

Reading these features was a reminder to me of just how fascinating scientific inquiry can be. I hope you'll enjoy the reading as much as I did and that you'll also feel a sense of pride in the great work being done in the sciences at UNCW.

Best regards,

David P. Cordle

David P. Cordle, *Dean*
COLLEGE OF ARTS AND SCIENCES

Arts & Sciences

The Magazine of the **College of Arts & Sciences** at the University of North Carolina **Wilmington**

The College of Arts and Sciences may best be viewed as through a kaleidoscope – where each area of focus is placed in a line of vision and can be viewed in varied colors from diverse sides.

This issue of **Arts & Sciences** reflects the sciences with emphasis on the intellectual energy expressed in faculty research and scholarly pursuits that inform the student experience and energize learning opportunities at UNCW.

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Read how Charles White forged his own unique academic path.

Travel with Dr. Lewis Abrams on a six-week expedition to locate and study the remains of a community destroyed by the cataclysmic eruption of the Tambora volcano.

Follow the work of women scientists like forensic anthropologist Dr. Midori Albert, who inspire students to pursue careers in the sciences.

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The Student Experience: Charles White

BY CHARLES WHITE AND KIM PROUKOU

UNCW/JAMIE MONCRIEF

> "My educational goals have truly evolved since I've been at UNCW. Here is a funny example: To fulfill my basic studies science requirement, I took a paleontology course – which I loved – from Dr. Patricia Kelley in earth sciences. I did this because at the time I thought I had no interest in taking a biology course! **Who would have thought that I would find my passion in an area that intersects biology with the applied sciences?** I loved the paleontology class, and had I not already known my desired major I could have easily ended up in earth sciences. I have truly gained so much out of each of my experiences here at UNCW. I would never have had the accessibility to the incredible scientists that I have worked with at another institution."

"When I first saw Charles, he was engrossed in the opaque explanations of a manufacturer's manual for a graphics computer workstation whose hard drive had failed," said Gene "Dr. Tag" Tagliarini, associate professor in the computer science department. "First impressions were of a tech-savvy computer geek. Charles was so enthusiastic about the task of fixing that computer [that] in two weeks, he had restored the machine."

Charles White came to UNCW as a freshman from the tiny town (pop. 6,000) of Hamlet, N.C., knowing he had an aptitude for computers and thinking that a computer science degree would lead him to a good job. Fast-forward about a year, and his interests had expanded to include Spanish, and he had begun to talk about the merits of double-majoring.

"I saw myself at that time as this kid from a single-parent home where it was difficult making ends meet. I wanted to prepare myself as best I could to obtain a well-paying job. I knew that I had a high level of competency with computers and was confident that a degree in computer science would lead me to a satisfactory career. I began studying Spanish because I believed that it would improve my marketability and because I was so intrigued with languages," Charles said.

"Soon after that, Dr. [Ronald J.] Vetter, then-chair of the computer science department, sent me to see Dr. Tagliarini about a directed independent study in computer architecture. Dr. Tagliarini seemed interested but reserved. He took out this huge, dusty book on computer architecture, handed it to me, told me to read it and then come back and see him. During this transaction, I noticed another book on his shelf titled *Swarm Intelligence*. I asked him if I could borrow that book, as well."

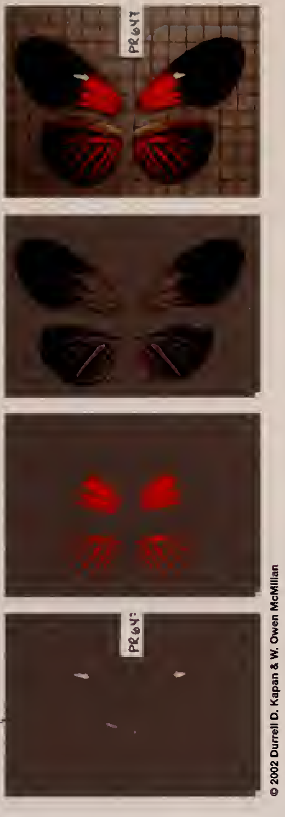
At home Charles began reading the book on computer architecture. After a few pages, he put it away and took up the book on swarm intelligence. "I couldn't put it down," he said. "I read the whole book. I thought – we can do something like this in the department. I want to do this!"

Computerized swarm systems work similarly to swarms of insects such as bees, termites or ants that perform highly specialized tasks for collective benefit, as when fish school for self-defense or ants forage for food. This behavior is sometimes described as "intelligent." While studying swarm intelligence, Charles approached another computer science student, Sean Watson '06, who was working on a project that would classify butterfly wings from their digital images. Charles suggested the possibility of working together; he thought he could write a computer algorithm that would "fingerprint" the wings.

"My platform for study is mathematics. Computer science allowed me to apply mathematics in a powerful way," Charles said. With his skills in mathematics and computer science, Charles wrote an algorithm that allows the computer to simulate swarming. His program scouts for pixels of similar color and marks them, analogous to the laying of trail-marking pheromone by ants. Charles' program is able to segment an image of butterfly wings into its individual color components.

The algorithm helped to advance the research of his fellow student and gave Charles the opportunity to publish his first undergraduate research paper. He presented his findings on swarm intelligence at the IEEE SoutheastCon 2004, a major technical and engineering conference in Greensboro, N.C., where his manuscript was published in the conference proceedings.

"After completing this first research project, I knew that I had found my passion. I wanted to continue my research in swarm intelligence and biologically inspired computing. This was leading me in the direction of the natural sciences, but I needed to learn more if I was to go further. What I have discovered is a philosophy that I now hold dear. I strongly believe that nature is a near-perfect system. We can learn so much from studying the way that nature works. Modeling nature's problem-solving systems, we can adapt them to solve new problems," Charles said.



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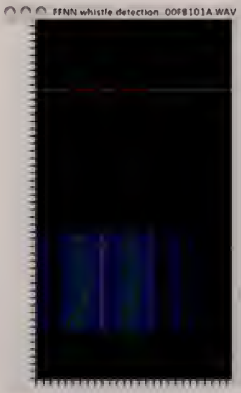
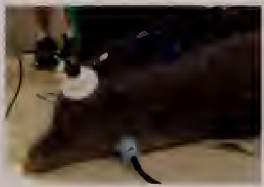
Working at the Center for Marine Science, White's ability to segment the color pixels of a butterfly's wings has been further adapted to classify dolphin sounds, segmenting "inflections" of dolphin whistles to better understand the natural communication of these mammals.





Tagliarini is Charles' role model and inspiration, and Charles credits the professor for a selfless interest in his academic progress. "When I published the paper on swarm intelligence, there were many opportunities open for our research team to pursue. But Dr. Tag encouraged me to take a different opportunity, the opportunity to study abroad - to go to Spain. I was interested in experiencing another culture to better understand human diversity. My ethics are rooted in these things. So I took his advice and spent a semester abroad. The experience taught me so much and changed me for the better. I realized we all are so very alike and deeply connected. When I returned, we had to pick up where we left off in our research, but Dr. Tag didn't mind."

"This is what UNCW did for me: I came in search of a career and found a life's passion. Sure, I was from a small town in the Carolinas, but [I] found myself in Spain. And all the things I love – science, language, diversity – it all started to come together in that study abroad. I lost a semester in my research, but gained so much more. A liberal arts education, hey, that's what it's all about."

Back from Spain, searching for a research topic for a seminar class in pattern classification, Charles found Laela Sayigh, associate professor in the department of biology and marine biology and researcher at UNCW's Center for Marine Science. Sayigh wanted to investigate computerized methods for classifying dolphin whistles. For Charles, her project would fulfill a long-held desire to work at the Center for Marine Science.

"When Dr. Sayigh explained her problem to me, my mind began to surge with new ideas. I got so excited! I have been studying the acoustic communication of dolphins for over a year now, analyzing dolphin whistles to understand how their natural communication system functions," Charles said. He and Sayigh hope to publish their findings soon in the *Journal of the Acoustical Society of America.*

"Initially I was working with computers. In pursuing the project with Dr. Sayigh, I found new interests – cognition and learning, signal processing and how dolphins communicate – that have helped me to define my long-term goals. After finishing my work at UNCW, I hope to pursue a Ph.D. in Ocean Engineering at Woods Hole."

Woods Hole Oceanographic Institution (WHOI) is affiliated with the Massachusetts Institute of Technology (MIT). The highly acclaimed MIT/WHOI Joint Program in graduate studies has an enrollment of only 120-130 students.

"Oh, that's another thing. In order to be adequately prepared to attend a place like Woods Hole, I needed more courses in relevant sciences. I don't want to appear as if I'm just hanging around as a perpetual undergrad. But, I want to get my Ph.D. at Woods Hole, and they have specific requirements. To feel confident in my preparation, I am taking supplemental courses in the natural sciences and continuing my research here at UNCW. Then the Hollings Scholarship appeared, and you know, it's a full-paid scholarship with a summer internship with the National Oceanic & Atmospheric Administration (NOAA). What an amazing opportunity! And I could not have applied for it had I not made the decision to continue my coursework," Charles said.

> *"I came to UNCW in search of a career and found a life's passion. All the things I love — science, language, diversity — all started to come together during my study abroad. I lost a semester in my research but gained much more. Hey, that's what a liberal arts education is all about!"*

Charles in Toledo, Spain

Two UNCW students, **Charles White '07** and **Janie McGregor '07,** were among 110 juniors and seniors chosen from across the nation and Puerto Rico to receive the Ernest F. Hollings Undergraduate Scholarship, established this year to honor retired Senator Ernest F. Hollings of South Carolina for his career-long promotion of ocean research and atmospheric studies. The scholarship provides up to $8,000 per year for full-time academic assistance, a 10-week, full-time paid internship position and housing subsidy during the summer of 2006 at a NOAA or partner facility, as well as travel expenses to participate in a Hollings Scholarship Program Conference at the end of the summer internship.

Janie McGregor is working with **Dr. Thomas Lankford,** assistant professor of biology and marine biology, examining the biology, ecology and conservation of marine fishes. Her research includes habitat ecology and recruitment patterns of marine fishes in estuarine and surf zone environments of Southeastern North Carolina. McGregor has applied to serve her internship at the National Marine Fisheries Service Pacific Islands Fisheries Science Center, Honolulu Laboratory, Hawaii; White has applied to Woods Hole. White and McGregor will be notified of their internship placements in February.

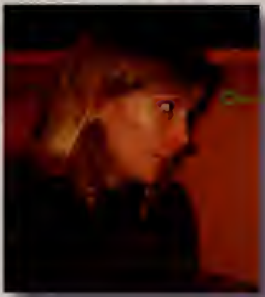
UNCW Women in Science

UNCW women scientists are represented at the cutting edge of scientific research both nationally and internationally; their teaching is prioritized and integrated with research. Serving as role models and mentors for all students, they particularly inspire and encourage women, traditionally underrepresented in the sciences. By encouraging the woman undergraduate or graduate student to consider the role she desires to fill in her chosen field and the path best suited for her individual development, these professors make UNCW a great place for women in science.

Midori Albert

ASSOCIATE PROFESSOR, ANTHROPOLOGY

Dr. Midori Albert is a forensic anthropologist trained in human body recovery, skeletal identification and trauma analysis. Albert spent 11 days in the aftermath of Hurricane Katrina recovering the remains of victims who died during and after the storm. She described the experience as "life-changing." A community of funeral directors, coroners, CSI agents, social workers and anthropologists, as well as support crews demonstrated heroic service and personal commitment to their duties. These collaborative efforts fostered friendships and showcased the cumulative contributions of individuals, society, politics, economics and ideology that anthropologists are trained to appreciate and value in a holistic way. "In theory I learned these things as a student of anthropology," Albert said. "Now I have had the opportunity to see these facets of life expressed in action."



Caroline M. Clements

ASSOCIATE PROFESSOR PSYCHOLOGY AND DIRECTOR OF UNCW CENTER FOR TEACHING EXCELLENCE

Dr. Carrie Clements is leading a $9.5 million project funded by the U.S. Department of Education to investigate ways to reduce violence in New Hanover County schools. Clements' work involves evaluation of current programs that aim to reduce violent behaviors and is supported by $1.05 million of the total grant. Undergraduate students coordinate data collection with 21 different community sites; graduate students analyze progress towards grant goals of violence reduction, substance abuse prevention and mental health promotion. All agencies currently providing programs to county schools to attain these goals will receive evaluations every six months, and reports will be produced individually for each school that uses an agency's services. The value of these examinations and their subsequent report cards is that schools will know what programs are truly producing results and what programs are not. Finally, information learned from the study about effective methods of teaching positive social skills, reducing negative behaviors, violence and/or substance abuse will be disseminated to local governments and community groups to promote safer, healthier behaviors for all.

Wei Feng

CHAIR AND PROFESSOR, MATHEMATICS AND STATISTICS

Dr. Wei Feng's research interests are functional analysis and differential equations, dynamical systems, reaction-diffusion systems with time delays, and mathematical modeling in chemistry, biology and ecology. Feng is a strong supporter of student research and learning. Of the 27 research articles published in journals of mathematical analysis and applied mathematics, eight were joint efforts with her students. She recently directed nine master's degree theses and one honors thesis. This year, five graduate students in the department she chairs received Summer Research Awards and two won UNCW Graduate Student Achievement Awards.

Liping Gan

ASSISTANT PROFESSOR, PHYSICS AND PHYSICAL OCEANOGRAPHY

Dr. Liping Gan's research focus is nuclear and particle physics, with a specialty in research on quantum chromodynamics at low energy and hypernuclear physics. She is an active member of PrimEx, an international collaboration working on an experiment to measure the neutral pion lifetime with high precision. At the Thomas Jefferson National Accelerator Facility Laboratory (TJNAF) in Newport News, Va., Gan is involved in investigations of fundamental issues of strong interaction such as anomalies and chiral symmetry breaking in Quantum Chromodynamics (QCD). Each summer, Gan brings promising UNCW undergraduate students to the Jefferson Lab to work. The students have presented their research results at department colloquiums and represented UNCW at various undergraduate research conferences.

Patricia H. Kelley

PROFESSOR, EARTH SCIENCES

Dr. Patricia Kelley is an invertebrate paleontologist specializing in the evolution and ecology of fossil mollusks. Kelley involves both undergraduate and graduate students in research, taking students to professional meetings to present the results of their thesis work or class research projects. The recipient of numerous teaching awards, including the 2003 Outstanding Educator Award from the Association for Women Geoscientists, Kelley received a UNCW Award for Faculty Scholarship in fall 2005. Kelley is a past president of the Paleontological Society, former chair of the department of earth sciences, and current president of the Board of Trustees of the Paleontological Research Institution.

Lynn Leonard

PROFESSOR, EARTH SCIENCES AND DIRECTOR OF CORMP

Dr. Lynn Leonard believes that experiential learning is essential to science education. Students participate in several funded-research projects under her supervision, including the quantification of surface flow hydrodynamics and particulate transport in the Florida Everglades; analysis of sediment dispersal in tidal marshes of the Chesapeake Bay (and other marsh systems); study of sediment transport during storms on the mid-continental shelf; and research on the impact of river dredging on tidal amplitude and marsh sedimentation in the Cape Fear River. Leonard was recently appointed director of the Coastal Ocean Research and Monitoring Program (CORMP), an interdisciplinary coastal monitoring and research program with annual funding from the National Oceanic and Atmospheric Administration (NOAA). CORMP, primarily funded by NOAA, is a member of the congressionally mandated Integrated Ocean Observing System (IOOS).

Laurie J. Patterson

ASSISTANT PROFESSOR, COMPUTER SCIENCE

Why do little girls in China and India enjoy math and science and go on to careers in the sciences? What will this trend mean as America tries to compete with these countries when some studies show more than half of our population, both boys and girls, shun science? These are some of the questions Dr. Laurie J. Patterson seeks to address in her teaching and research. Former assistant chair of the computer science department, Patterson recently completed her doctor of education degree in computer information technology with a concentration in computer education.

D. Ann Pabst

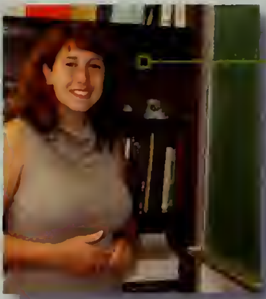
ASSISTANT CHAIR, GRADUATE COORDINATOR, AND PROFESSOR, BIOLOGY AND MARINE BIOLOGY

Dr. Ann Pabst's field is marine mammalogy, particularly cetaceans - whales, dolphins and porpoises – their musculoskeletal design and thermoregulatory function. Pabst collaborates with colleagues and students, both undergraduate and graduate. Other collaborators include the Center for Marine Science, the U.S. Coast Guard, state and local agencies and private citizens, colleagues at NC State University, Duke University Marine Lab, National Marine Fisheries Service, North Carolina Maritime Museum, the Karen Beasley Sea Turtle Rescue and Rehabilitation Center, North Carolina Aquarium at Fort Fisher and the Virginia Marine Museum. Pabst's research and efforts in the UNCW Marine Mammal Stranding Network serve to preserve and protect the welfare of these mammals.

Pamela J. Seaton

PROFESSOR, CHEMISTRY AND BIOCHEMISTRY

Dr. Pam Seaton is an organic chemist whose interests range from synthesis of molecules for investigation of how chemicals interact with each other in solution and identification and synthesis of fatty acids and lipids present in marine algae and fish to the isolation and structure elucidation of bioactive marine natural products. In the classroom, she insists that all students learn the laboratory skills necessary to make reactions or analyses work – as well as the chemistry that underpins the procedures. She trains students to operate instruments such as the Nuclear Magnetic Resonance spectrometer and the Gas Chromatograph-Mass Spectrometer and to analyze their spectra, skills essential to their education as chemists. Several of Seaton's students have co-authored publications with her and presented student research projects at regional and national American Chemical Society meetings.



Susan J. Simmons

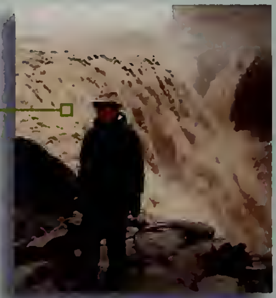
ASSISTANT PROFESSOR, MATHEMATICS AND STATISTICS

Dr. Susan Simmons' research interests are bioinformatics, metabolomics, Bayesian statistics and statistics education. Simmons is an active member of the American Statistical Association, the Mathematical Association of America, and Project NExT-SE (New Experiences in Teaching, Southeastern section), a national initiative for recent Ph.D.s in mathematical sciences interested in improving the learning and teaching of undergraduate mathematics. She is a member of the metabolomics group, based out of the Statistics and Mathematics Sciences Institute (SAMSI), a national research partnership of Duke University, NC State University, The University of North Carolina at Chapel Hill and the National Institute of Statistical Sciences in cooperation with the National Science Foundation. Simmons accompanies both undergraduate and graduate students to workshops and conferences offered by SAMSI.

Ami E. Wilbur

ASSOCIATE PROFESSOR, BIOLOGY AND MARINE BIOLOGY, CENTER FOR MARINE SCIENCE

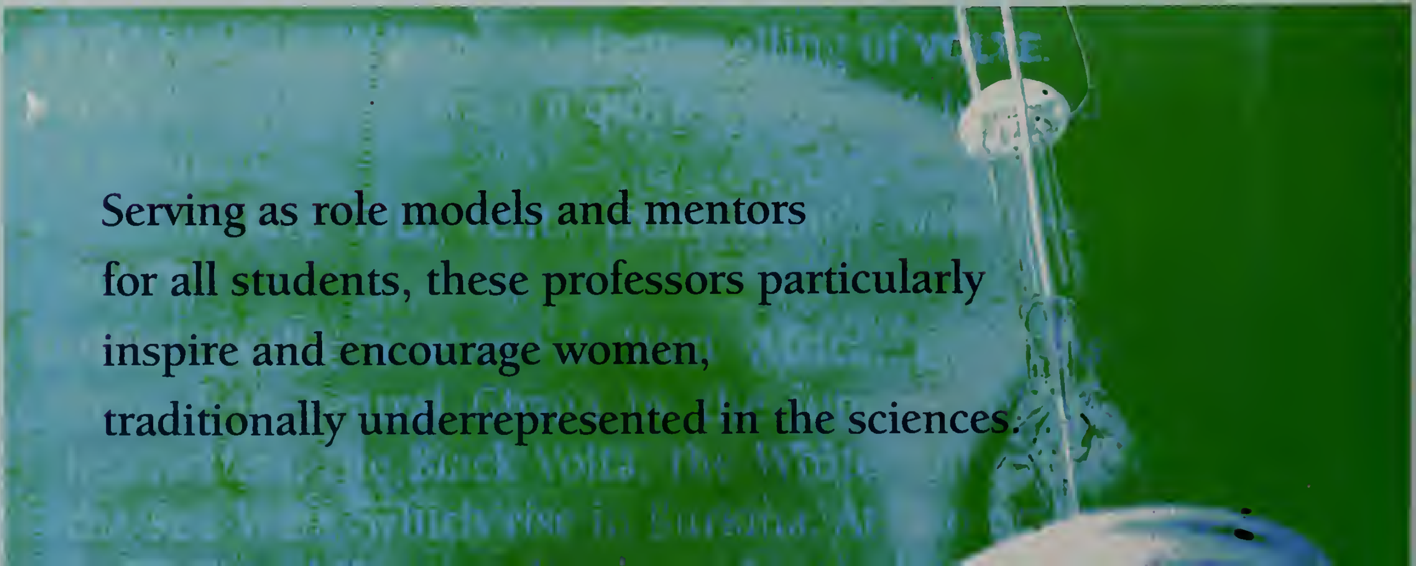
Dr. Ami Wilbur and her students are involved in regional efforts directed at reversing the long decline of oyster populations on the Atlantic coast. Their research focuses on the application of modern molecular techniques to basic and applied questions in shellfish genetics and mariculture. One aspect of the research identifies potential sources of disease-tolerant oysters and develops genetic markers that will not only facilitate selective breeding of disease-tolerant stocks but also permit the tracking of their success in the natural environment.



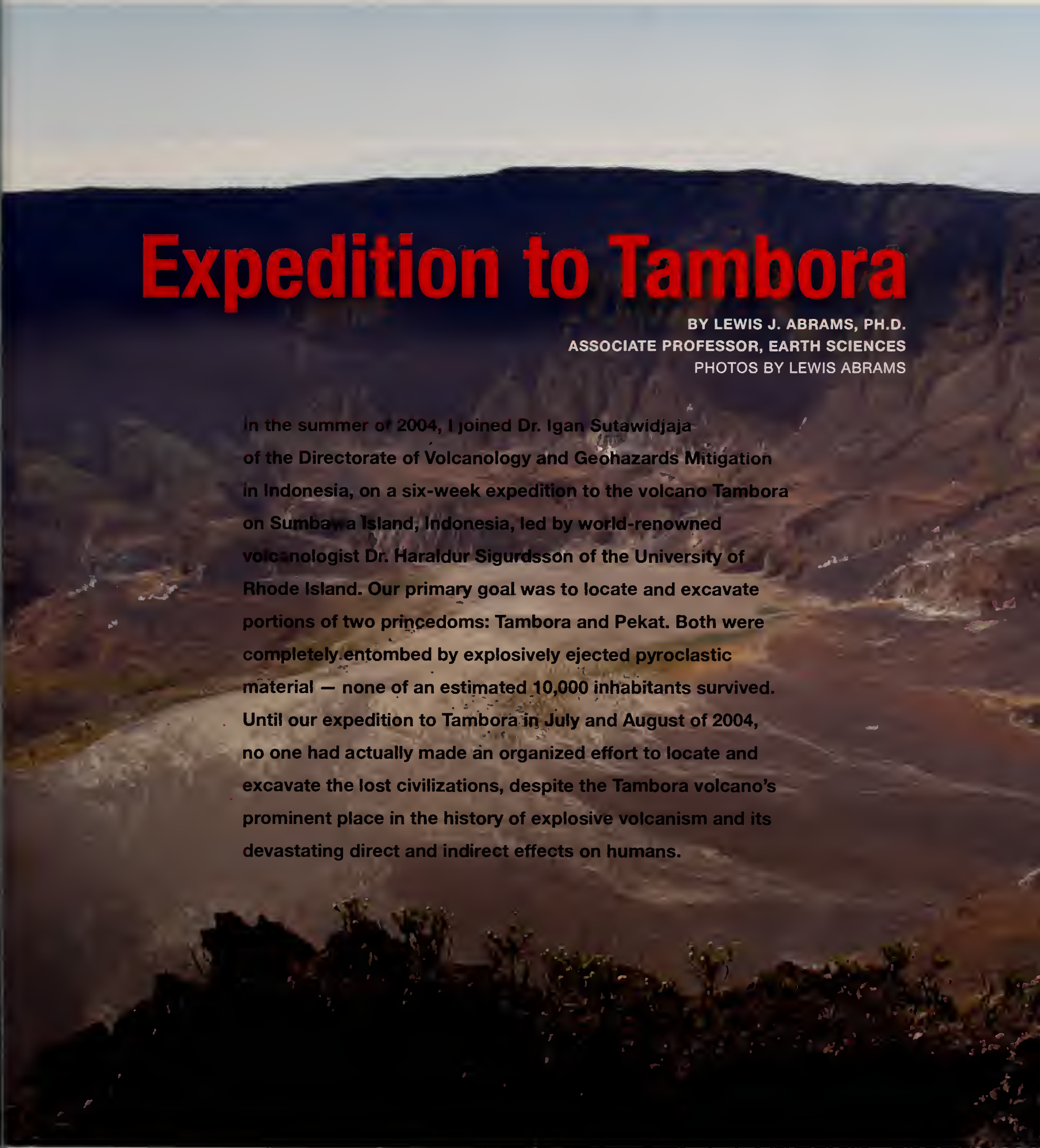
Joan DeWitt Willey

ASSOCIATE DIRECTOR OF EDUCATION, CENTER FOR MARINE SCIENCE, PROFESSOR OF CHEMISTRY AND BIOCHEMISTRY

Dr. Joan Willey is a marine environmental chemist who specializes in the chemistry of rainwater and the impacts of rainwater on surface seawater. Since 1978, 72 undergraduate students have worked on various research projects with Willey. Willey has supervised 23 master's degree students, one doctoral student and two post-doctoral fellows. Among her awards and recognitions for teaching and research are the UNCW Faculty Scholarship Award in 1994 and the UNCW Graduate Mentor Award in 2004. The goal of examining and analyzing mercury levels in the waters of the Cape Fear region is to contribute to better management of several freshwater and marine fisheries in our region now under health advisories because of high levels of methyl mercury in fish.



Serving as role models and mentors for all students, these professors particularly inspire and encourage women, traditionally underrepresented in the sciences.



Expedition to Tambora

BY LEWIS J. ABRAMS, PH.D.
ASSOCIATE PROFESSOR, EARTH SCIENCES
PHOTOS BY LEWIS ABRAMS

In the summer of 2004, I joined Dr. Igan Sutawidjaja of the Directorate of Volcanology and Geohazards Mitigation in Indonesia, on a six-week expedition to the volcano Tambora on Sumbawa Island, Indonesia, led by world-renowned volcanologist Dr. Haraldur Sigurdsson of the University of Rhode Island. Our primary goal was to locate and excavate portions of two princedoms: Tambora and Pekat. Both were completely entombed by explosively ejected pyroclastic material — none of an estimated 10,000 inhabitants survived. Until our expedition to Tambora in July and August of 2004, no one had actually made an organized effort to locate and excavate the lost civilizations, despite the Tambora volcano's prominent place in the history of explosive volcanism and its devastating direct and indirect effects on humans.

A crew from Cicada Films, a London-based company specializing in television documentaries, was able to film portions of our expedition and excavation during a 10-day stay at our camp. The film, presented by the Discovery Channel in 2005 as *Pompeii of the East* or *The Year Without a Summer*, emphasizes the global impact of the Tambora eruption.

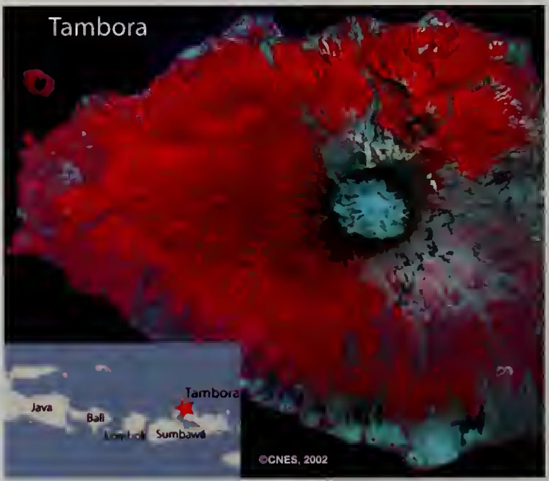
The April 1815 eruption of the Tambora volcano was the largest volcanic event in recorded history. Portions of the Indonesian archipelago as far as 373 miles (600 km) away from the volcano experienced total darkness for three days because the skies were so laden with fine ash. Once nearly 14,000 feet high (4,200 m), Tambora was cataclysmically reduced to its present elevation of 9,350 feet (2,850 m) with a central crater (caldera) that is more than 4 miles wide (7 km) and almost a mile deep (1,250 m), the deepest caldera on Earth. The erupted material (100 km^3), approximately 150 times greater than the volume of material ejected during the 1980 eruption of Mount St. Helens, surpassed by 10 times the magnitude of the more famous eruption of Krakatau in 1883. In all, an estimated 92,000 people were killed as a result of this eruption just on the Indonesian islands of Sumbawa and neighboring Lombok.

Among the best early-documented aspects of the eruption were the spectacular effects on sunsets and the dimming of celestial objects viewed from Europe after ash and aerosols, ejected into the upper atmosphere, had circled the Earth. Unfortunately, the documented global effects would not be limited to brilliant red-and-purple sunsets; far more serious effects on world climate were to follow. A year after the eruption, in the summer of 1816, scattered snow and killing frosts peppered New England, and record cold and rainy conditions swept across Western Europe. These unusual weather conditions led to crop failures, contributing to famine that was especially damaging and widespread in Europe. That disastrous year also resulted in a literary legacy for this was when Mary Shelly wrote her famous novel *Frankenstein* during that cold, dreary summer in Switzerland:

> I passed the summer of 1816 in the environs of Geneva. The season was cold and rainy, and in the evenings we crowded around a bluing wood fire and occasionally amused ourselves with some German stories of ghosts which happened to fall into our hands. These tales excited in us a playful desire of imitation...and (I) myself agreed to write a story founded on some supernatural occurrence...
>
> — Mary Shelley

That dismal summer was so cold – frosts, snow and freezes in June in New England – that 1816 became known as "the year without a summer."

My first objective during the expedition was to use a ground-penetrating radar system to establish thickness variations in the pyroclastic material known to have buried the princedom of Tambora during the eruption of 1815. My immediate goal was to find a



Geophysicist Lewis Abrams, associate professor of earth sciences at UNCW, sits on the rim the volcano's caldera. Abrams' role was to locate buried evidence of human remains and structures using a ground-penetrating radar system for world-renowned volcanologist Haraldur Sigurdsson, shown on the facing page during filming of the expedition. The system located an optimal site for excavation. Sigurdsson, working like a detective, was able to pick up clues, both physical and chemical, from this site and the few remains of its inhabitants, as well as from his examination of the crater, that tell much about the energy of the explosion. The volcanic explosion of Tambora Mountain equaled 3 million Hiroshima bombs.

location where the cover was thin enough so that the three of us could reasonably excavate using picks and shovels. We selected the exploration site based on verbal reports of artifacts – pottery shards, jewelry and coins – found by present-day inhabitants of Tambora village after a fortuitous exposure when a narrow logging road was cut through the jungle in the early 1980s.

We set up camp and began our survey along this unimproved dirt "road" and within an adjacent eroded gully approximately 1 mile (1.5 km) outside the present-day village of Tambora. We found that the thickness of the pyroclastic material at this location ranged from about 6-13 feet (2-4 m), and that at one location the erosion of the gully had removed most of this material. It was in this gully, which we later called "museum gully," that we eventually excavated the skeletal remains of humans within the now-collapsed and completely charred framework of a multi-room hut.

The sequence of volcanic layers at the excavation showed that the initial ash and pumice fall did not destroy the building or kill the inhabitants. Instead, it was a fluid mixture of hot (1000° C/1832°F) gases and volcanic debris, collectively known as a "base surge," moving down the slopes of Tambora at hundreds of miles per hour, incinerating everything in its path. The surge and subsequent pyroclastic flows resulted from the collapse of eruption columns that had reached altitudes of over 25 miles (40 km) during eruption. The 79 A.D. eruption of Vesuvius and destruction of Pompeii and Herculaneum is a famous example of this most destructive type of volcanic activity.

Today, the site of the largest volcanic eruption in recorded history is monitored by a single coffee plantation worker, who makes a lonely climb once a month to the rim of Tambora to check on the caldera.

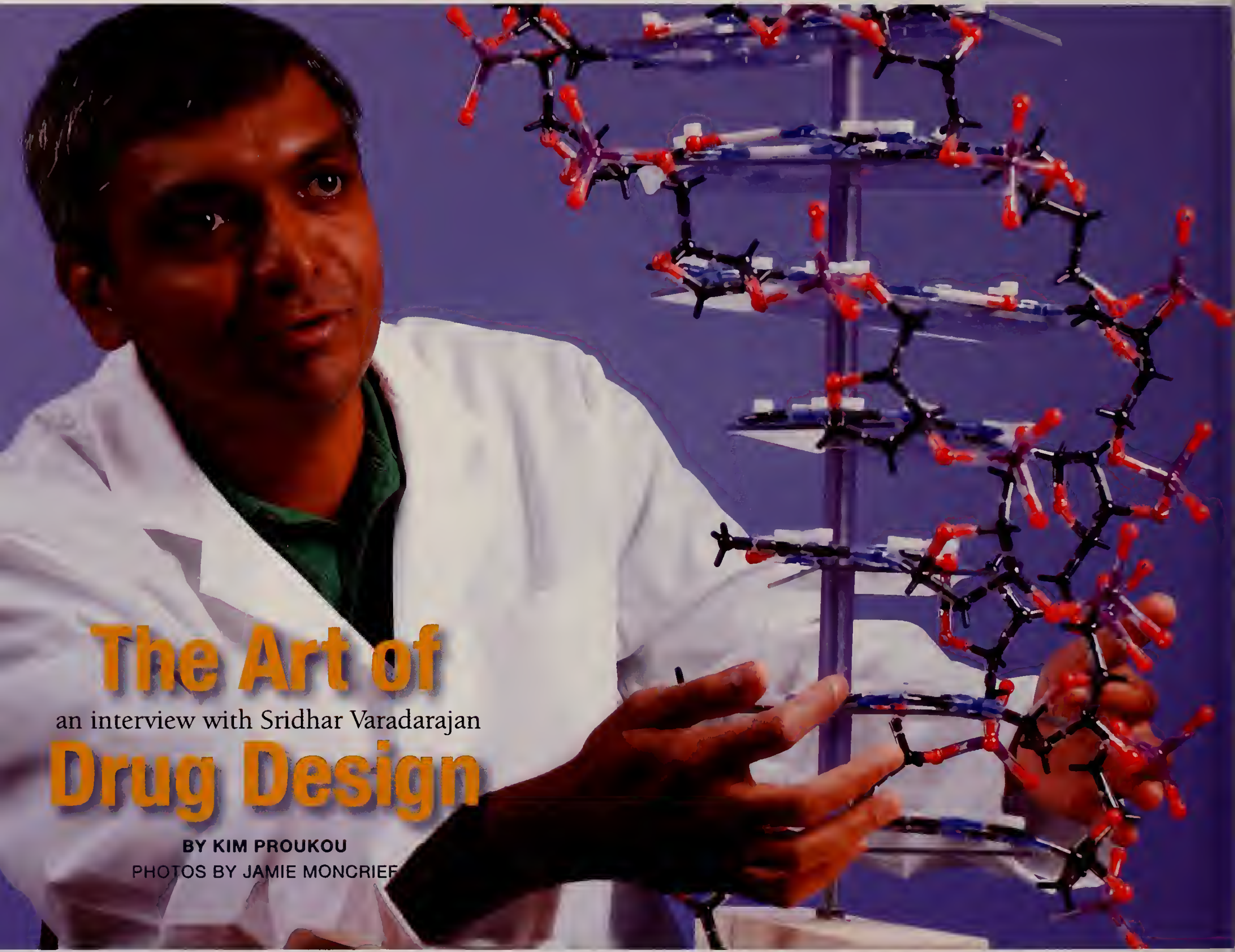
The story of Tambora highlights two aspects of large volcanic eruptions: direct effects and global effects. The direct effects of volcanic surges and pyroclastic flows can devastate the flanks of now-heavily populated active volcanoes such as Vesuvius, near Naples, Italy, and Merapi, Yogyakarta, Indonesia. Their global effects result in climate changes. Concerted efforts to document and understand natural causes of climate change help us to understand how human activities alter the global environment.

The catastrophic December 26, 2004, tsunami reminds us of the need to further understand and more carefully monitor the sources for major natural disasters resulting from the combination of high population and development of areas where explosive volcanism, earthquakes and other catastrophic natural events are likely to occur.

EDITOR'S NOTE: The DVD Discovery Channel documentary 2005, *The Year without a Summer*, is available through the UNCW Randall Library, keyword "Tambora."

"I passed the summer of 1816 in the environs of Geneva. The season was cold and rainy, and in the evenings we crowded around a blazing wood fire and occasionally amused ourselves with some German stories of ghosts which happened to fall into our hands. These tales excited in us a playful desire of imitation...and (I) myself agreed to write a story founded on some supernatural occurrence..."

— MARY SHELLEY
from the preface to *Frankenstein*



The Art of Drug Design

an interview with Sridhar Varadarajan

BY KIM PROUKOU

PHOTOS BY JAMIE MONCRIEF

"I came to UNCW because I wanted a place where I could pursue my research interests because I have all these ideas that I want to test, but I also wanted to teach. I love teaching. I didn't want to compromise on either the research or the teaching. So, I asked myself, 'Where can I go where I can do both?' This department of chemistry and biochemistry seemed to be one of the very few I considered that placed equal emphasis on both teaching and research. We are successful with research and successful with teaching. We are proving that this balance can be achieved."

Ph.D., Physical Organic Chemistry Pennsylvania State University, (1997)

Postdoctoral Scholar Advisor: Dr. Allan Butterfield, Professor and Director, Center for Membrane Sciences, University of Kentucky, (1997-2000)

Postdoctoral Fellow Advisor: Dr. Barry Gold, Professor and Associate Director, Eppley Institute for Research in Cancer and Allied Diseases, University of Nebraska Medical Center, (2000-2003)

> "Cumulatively, all of the research paths I took led to where I am today. All of them were indispensable." – Sridhar Varadarajan

VARADARAJAN: We stay current and keep challenging ourselves by doing new research. If I am not up to date with the literature, I cannot transmit that new knowledge to my students, and, consequently, they cannot go out into the world properly prepared. Research and teaching go hand in hand.

In the last year, 110 undergraduate and 20 graduate students were working on exciting research here, and these numbers are steadily increasing because we are receiving more and more funding.

Q: How do you involve the students in your research?

VARADARAJAN: My students are the ones making the molecules in the lab, gaining invaluable experience and skills. If students go to a lecture, listen to a great teacher and learn all the theory – that is good, but it's like reading a cookbook and saying, "I know all about cooking." You don't know anything about cooking until you start cooking. The cookbook doesn't tell you that if you have a wet utensil and you pour oil on it and heat it, it will splatter. You learn that when you splatter yourself and say, "Oh, I won't do that again." Students have to gain experience in applying theory and chemical principles to actual practice. This is what industry is looking for: people who have been trained in techniques and who have laboratory experience.

* * *

Q: How long has the science been available to make molecules that target specific sites on DNA in specific cells?

VARADARAJAN: The quick answer is – forever! This is how the human body is designed – to know when to turn chemical processes off and on in order to protect and heal itself. We are just beginning to understand and learn how this happens and to question whether we can control it in some way to enhance health and/or terminate, or at least control, the progression of disease.

The body gives us our clues. For every cell there are particular enzymes or proteins or small molecules called ligands that bind to particular receptors in the particular cell that accommodates them and mediate reactions only in those cells.

We have to identify the ligands that will bind to the particular receptor on a cell we want to control, then modify it so that we can attach what we want. In the case of cancer, we want a molecule that will inactivate the cancerous cell before it becomes committed to a new division cycle. It is a simple idea but a complex process.

Q: How close is science to targeting and attaching ligands in such a way that they will bind to renegade cancer cells?

VARADARAJAN: I would say it's still awhile away. The body's defense mechanisms may never allow us to get to the point where we can be completely selective, but that's a good thing because the defense mechanisms protect the body's integrity.

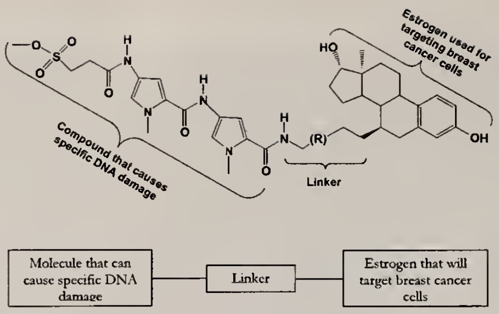
Normal cells die after a certain time. Cancer cells don't die easily, and cancer cells grow and divide so rapidly; they need many more nutrients and raw materials. There is a promising field of cancer research that aims to stop the growth of cancer cells by cutting off the flow of nutrients to the tumors. There are many, many different ways to target cancer cells, and eventually it may come to be that the best method for a certain cancer will be some combination of approaches. The day of one-drug-fits-all is gone.

The reason why we have had these withdrawals of drugs like Vioxx is because we used to think that the same drug is going to work the same way in everybody. We are learning that there are small but very important individual differences. Added to this is the fact that cancer itself is not one disease. It is a combination of many diseases within a highly complex system of regulation and control – the natural birth, life and death of cells – going on in the body all the time.

Again, we have the natural processes of the body itself to help us here. All cells in the human body have the same DNA – eye cells, heart cells, ear cells, etc. So why are these cells, all with the same DNA, different? Because like a house with light bulbs in every room that can deliver different levels of light to each, someone must either turn them on or off. So, each cell in the genes on the DNA waits for something to turn on its potential for differentiation. Genes turned on in a particular cell make certain kinds of proteins, diversifying and determining cell differentiation.

Many drugs we now treat cancer with are DNA-damaging compounds. When a DNA-damaging drug is introduced into the body, it attacks the DNA in all cells, healthy and cancerous alike.

One of the objectives of my research is this: Instead of having a drug going to all cells, healthy as well as cancerous, and having to depend on the body's natural last-line defense mechanisms to eliminate the cancer cells, I am trying to make molecules that will attack only the specific cancer cells, leaving all other cells alone. This would allow us to increase the power of the cancer-killing drugs, and, at the same time, reduce side effects.


Estrogen used for targeting breast cancer cells
HO
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(R)
Compound that causes specific DNA damage
Linker
Molecule that can cause specific DNA damage
Linker
Estrogen that will target breast cancer cells

Q: What is distinct about the molecular design research you and your students are pursuing here at UNCW?

VARADARAJAN: The site location on DNA that is damaged by the cancer drug is important. A successful drug has to damage the DNA at certain sites that will be noted by the DNA replication protein and result in the cell being tagged for death. If the DNA damage occurs at a site that is not noted by the DNA replication protein, the cell will not die and may even be mutated, leading to secondary cancers. This is a problem with some of the drugs currently being used; they are so indiscriminate in their DNA damage. The molecule I first worked on with Dr. Barry Gold at the Eppley Cancer Institute damages DNA only at sites that will result in cells being tagged for death. The challenge that we are addressing now at UNCW is to find a way to target this molecule to a particular cancer cell only. For example, in our lab we are presently trying to target breast cancer cells by attaching an estrogen appendage to a DNA-damaging molecule with a "linker" molecule, optimizing the chances that the breast cancer cells will accept the synthetic lethal-molecule.

Q: You mean this appendage, to the right of the linker molecule in the diagram (left), carries, by means of the linker, the lethal compound that will cause specific DNA damage, in this case, only to the breast cancer cells?

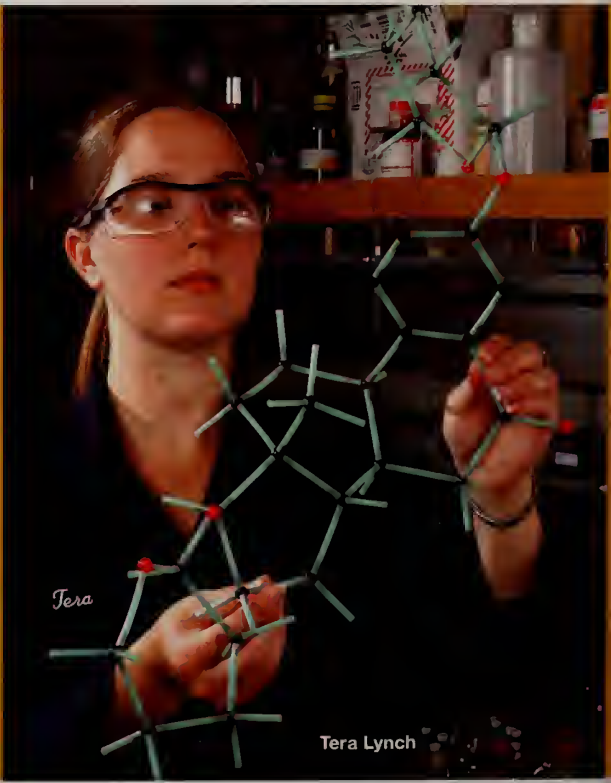
VARADARAJAN: Yes. Breast cancer cells have more estrogen receptors, and so estrogens can be used to target compounds to breast cancer cells. The question is: Will this appendage of estrogen, which will target the breast cancer cell, affect our lethal-molecule's interaction with DNA? Will the estrogen still target the breast cancer cells with the DNA-damaging compound hanging on to it? How long should the linker be that connects the molecules? We don't know.

*

Q: Do we have natural protections against cancer?

VARADARAJAN: Yes. For someone to get cancer, a lot of natural protections have to be circumvented. One protection is that large sections of human DNA are believed to be "fillers," evolutionary baggage that we have accumulated with no known function. When we sun ourselves on the beach, or we eat something that has toxins in it,

left to right, front row: **Tera Lynch, Lacie Smith, Heather Lewis, and Heather Hill; back row: Andreas Linke, Dr. Varadarajan, Matthew Corbitt and Andrew McIver.**


Tera

Tera Lynch

there will be damage to the DNA in the cells, but it most often occurs in these "filler" sections and not on the genes making important proteins. Another protection is that each cell has two copies of DNA, one from each of our parents. So even if serious damage occurs to a particular gene on one set, the intact gene on the other copy may kick in. This is the second protection – a spare set of genes from our parents.

A third protection is the activity of repair proteins that are present in all cells. These repair proteins travel up and down the DNA checking for damage, noting the damage and fixing it. When cells begin to divide, there are stages that act like checkpoints. When something is wrong, it is noticed at these checkpoints, the dividing process stops so that the repair proteins can fix it before the cell develops further. This is part of the body's natural repair and prevention process.

Q: What goes wrong to cause cancer?

VARADARAJAN: Here are some things that have to happen for a person to get cancer: The DNA in a cell has to have damage; the damage has to be in an important place (a gene); that damage has to be in both copies of the DNA received maternally and paternally; the repair proteins that fix damage have to be messed up; the proteins that stop cell division at the checkpoints when damage is noticed have to be messed up; and even at that point, when the damaged DNA has evaded these protections, even here, the protein making the new DNA is able to recognize that the damage has not been repaired and this protein is able to mark or "tag" this cell for death before it multiplies.

And all these things that I am telling you have to go wrong in the same cell. If the checkpoints are messed up in one cell, and there is DNA damaged in another cell, and the repair proteins are damaged in a third cell, it will not result in cancer. All the damage has to take place in the same cell for that cell to become cancerous. You see how difficult this is.

It usually takes years for this kind of damage to occur, and that is why cancer is usually a disease of the old. This is also why heredity plays such an important role. If one copy of DNA you got from your dad or mom already has the damage on a particular gene, you have increased your chance of getting cancer because all your cells now have this defect, and that is one less thing that has to go wrong in a cell for it to become cancerous. But even with an inherited risk, there are so many safeguards.

Matthew Corbitt

left: Andrew McIver; right: Andreas Linke

At UNCW, undergraduate students are able to conduct state-of-the-art research and receive research experience that is normally reserved for graduate-level students.

Andreas Linke '05, to the left and below, earned the distinction of becoming the second undergraduate student in 40 years to complete honors projects in two disciplines. Andreas graduated with university honors and honors in both chemistry and biology.

International, National and Regional

Psychology Department Promotes Student Learning

UNCW / JAMIE MONCRIEF

UNCW / CAROLINE CROPP

left: **The psychology building at the University of Canterbury, Christchurch, New Zealand, rises above the park-like setting of the campus.**

middle: **Professor Dale Cohen studies cognitive and perceptual processes particularly applicable to problems with learning and understanding and with memory.**

right: **Professors Len Lecci (l) and James Johnson (r) study perceptions of racism and bias.**

International Collaboration

A basic-science approach that combines laboratory research in psychology and pharmacology is the focus of a collaborative research project that UNCW department of psychology professor **Raymond C. Pitts** and lecturer **Christine E. Hughes** are conducting with fellow scholars at the University of Canterbury in Christchurch, New Zealand. Their research, supported by a 2004 UNCW research reassignment, investigates environmental and psychological factors that may lead to "impulsive" and "risky" decision-making and also how certain drugs might affect inclinations to impulsivity and dangerous risk-taking.

The research will also seek to identify psychological factors and drugs that might promote beneficial decision-making. The scope – psychological, pharmacological and educative – is a facet of the project that makes it an extraordinary learning opportunity for both students and faculty researchers alike.

For example, during the summer, Pitts was awarded a University of Canterbury Erskine Fellowship, which supported his return to New Zealand for additional study and teaching, and two UNCW psychology graduates, **Shanell Ryan '05** and **Holly Sansone '05**, are currently conducting research at the University of Canterbury in preparation for graduate studies.

Reciprocally, **Dr. Randolph C. Grace** of the University of Canterbury, visited UNCW in October 2005 to present an academic seminar called *Choice and the Matching Law*.

National Educational Research and Advisement

Professor **Dale Cohen** is working on a joint project between UNCW and the American Institutes for Research funded by the National Center for Education Statistics on assessments of adult literacy.

Cohen is researching the cognitive processes involved in reading documents such as forms, graphs, tables, lists, maps, and diagrams, seeking to identify where difficulties in reading these types of documents is most likely to occur and designing remedies to help readers unravel the challenges they present. Cohen's work also identifies ways to better write and construct these types of documents.

In addition, Dr. Cohen was an invited participant at the Sub-Committee on Science Testing and Assessment of the Mathematics and Science Initiative, Office of the Secretary, U.S. Department of Education, convened to discuss the implementation of the Science Assessment for the National Assessment of Education Progress (NEAP).

Collaborative Engagement:

Through Research

Perceptions of Racism and Bias

In 2003, professors **James Johnson** and **Len Lecci** developed and published the first empirically validated measure of black anti-white bias. Now known as the Johnson-Lecci Scale (JLS), this tool to measure perceptions of racism and bias has been shown to predict the extent that blacks will interact with whites and/or perceive racism in ambiguously racist situations.

Presently, Johnson and Lecci are researching to determine whether variations in responses on the JLS influence physical and psychological well-being.

"We are presuming that there would be negative consequences for the tendency to assume that most whites are racist," Johnson said. "For example, such assumptions may be stressful and associated with health consequences such as hypertension or ulcers. Furthermore, the tendency to believe that most whites are racist and willing to harm blacks could lead to general psychological distress. On the other hand, blacks who have a lower tendency to believe that most whites are racists may be generally less stressed and may be more physically and mentally healthy."

Preserving Memory

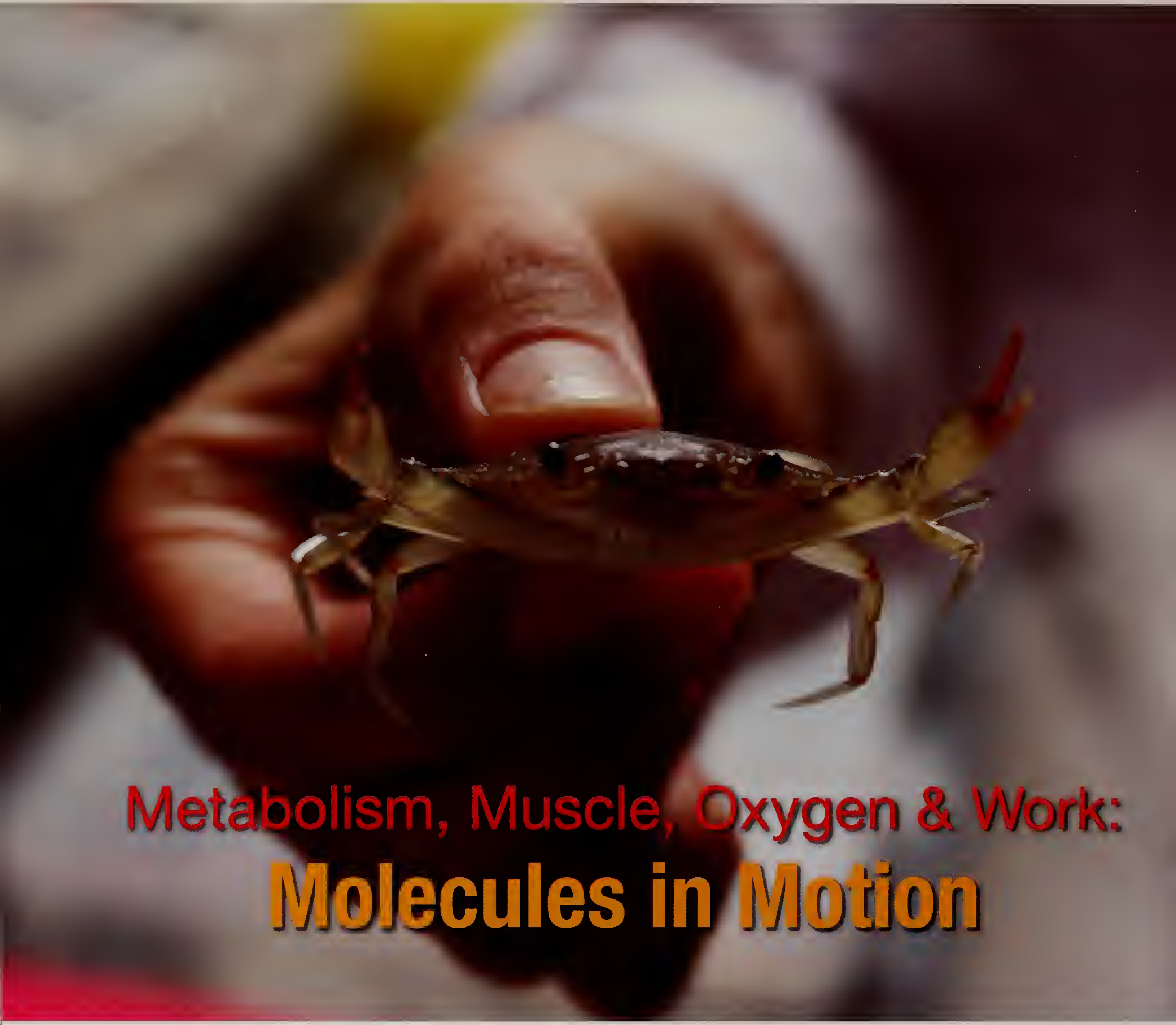
The psychology department, now a regional resource for understanding, detecting and preventing memory loss, is becoming nationally recognized for collaborative, interdisciplinary approaches to the study of memory.

- **Dr. Mark Galizio**, chair of the psychology department, has an on-going research project in collaboration with **James Cook**, a chemist at the University of Wisconsin-Milwaukee, exploring the possibility that newly developed compounds that target the brain's hippocampus area might enhance learning and cognition. Such drugs have the potential to increase treatment options for Alzheimer's disease and other forms of dementia.
- Neurogenesis: UNCW Professor **Julian Keith** conducts research on neurogenesis, the creation of new neurons in the adult brain, a process that may have a role in memory and learning. Keith's work, funded by $1.3 million over five years by the National Institute of Mental Health, has been aided by the recent acquisition of a $310,000 specialized microscope through an interdisciplinary National Science Foundation instrumentation grant written with colleagues in the biology and marine biology department. This microscope will permit three-dimensional imaging of nerve cells.
- Are there training programs that can reverse age-related cognitive decline? This is the focus of a new research initive by **Dr. Karen Daniels**. Research on autobiographical memory in the elderly by **Dr. Nicole Alea** examines just how vivid memories remain across the lifespan.
- Memory Assessment and Research Services (MARS) initiative, established spring 2005, developed by professors **Len Lecci**, **Julian Keith** and **Dale Cohen**, advances the scientific understanding of memory and memory deficits and provides education and affordable services to the public about memory disorders and their treatment. This service provides a benefit to the community as it advances understanding of normal and disease-related memory loss.

View from the psychology building across the campus of the University of Canterbury.

Improving Health Care for African-Americans

Professors **James Johnson** and **Nora Noel** with **Perri Bomar**, associate dean of the School of Nursing, are co-principal investigators on UNCW's part of a $3.5 million grant from the National Cancer Institute to New Hanover Regional Medical Center to study and correct disparities in cancer treatment of African-Americans. The UNCW part of this grant is a sub-contract of $550,000 to study some of the psychological barriers to early detection and treatment of cancer among African-Americans, such as distrust of medical professionals, and to develop strategies and interventions to overcome these barriers.



Metabolism, Muscle, Oxygen & Work:

Molecules in Motion

BY STEPHEN T. KINSEY, PH.D., ASSOCIATE PROFESSOR OF BIOLOGY AND MARINE BIOLOGY

PHOTOS BY ERIN WHITTLE, EW PHOTOGRAPHY

Did you know that a blue crab's backfin muscle grows in the same manner as human muscle? Muscle tissue grows by increasing the size of individual muscle cells rather than their number. This developmental pattern means that juvenile blue crabs have muscle cells that are very similar in size to those of a small child. However, as a blue crab grows to adulthood, its body mass increases more than 3,000 times. If humans grew like this, a 7-pound newborn would weigh 21,000 pounds as an adult! Since the crab's muscle fibers grow as it grows, adult blue crabs have muscle cells that are about 20 times larger than adult human muscle cells. This characteristic of blue crab muscles makes them important to studies that will ultimately aid our understanding of the function of cells in general, including human cell function.

My students and I in the department of biology and marine biology at UNCW are investigating the unique properties of muscles from marine organisms to better understand how processes at the biochemical, cellular, tissue and whole-animal level interact to affect animal function. What can the large muscle cells of blue crabs teach us about cell function in humans? To answer this question, we must first consider how molecules travel from place to place inside cells.

Molecules React, But They Move Around, Too

Most of what we know about biochemistry and cell function is derived from a century of carefully controlled laboratory experiments conducted using chemical solutions in test tubes. Research of this type has been extremely successful, yielding roadmaps of highly complex metabolic pathways, as well as contributing to our understanding of the molecular basis of many diseases.

Recent technological advances have allowed scientists to expand this approach. Today, noninvasive techniques allow researchers to study biochemistry in living cells. These approaches offer a more accurate picture of metabolism that is often quite different from the traditional view.

For example, the classical depiction of metabolic pathways is that of a series of molecules connected by arrows. The arrows represent the conversion of one molecule to the next in the pathway. This visualization represents test-tube biochemistry very well. However, to be true to living cell processes, the arrows need to also represent the movement of the molecules from place to place within the cell.

Molecules move about in cells by a process known as diffusion (one of Albert Einstein's theories). Like people walking through a forest in the dark, randomly changing direction every time they bump into a tree, so do diffusing molecules in a metabolic pathway "find" their way by bouncing off the cellular structures they encounter (which is why diffusion is sometimes referred to as a "random walk"). Therefore, a complete understanding of metabolism in living cells must include both the chemical conversion (reaction), as well as the movement of molecules to and from the reaction sites (diffusion). Accounting for both of these processes is known as a reaction-diffusion analysis, a familiar approach to chemical engineers but relatively new to biologists.

In the past, one of the difficulties of studying processes such as molecular motion in living cells is that it has been hard to measure intracellular events without disrupting the cells. Today, we can apply a host of methods in our research not available to us just a few years ago to look inside living cells (or even within living animals). Noninvasive techniques such as laser scanning confocal microscopy and nuclear magnetic resonance (NMR), which are a family of procedures that includes magnetic resonance imaging (MRI) are now widely available to biologists.

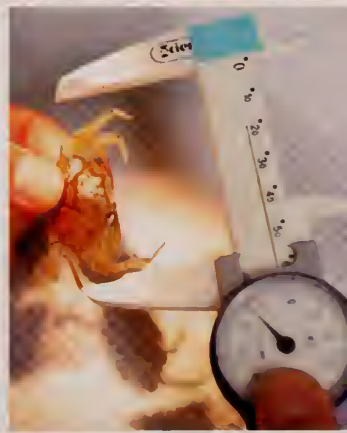
For example, using a special application of NMR, our lab demonstrated that the rate at which molecules move in living muscle depends on the direction of movement within the cylindrically shaped cells. This is important because muscle contraction depends on molecules moving across muscle cells, and it turns out that molecules move across muscle cells at about half the rate as they do when they move along their length.

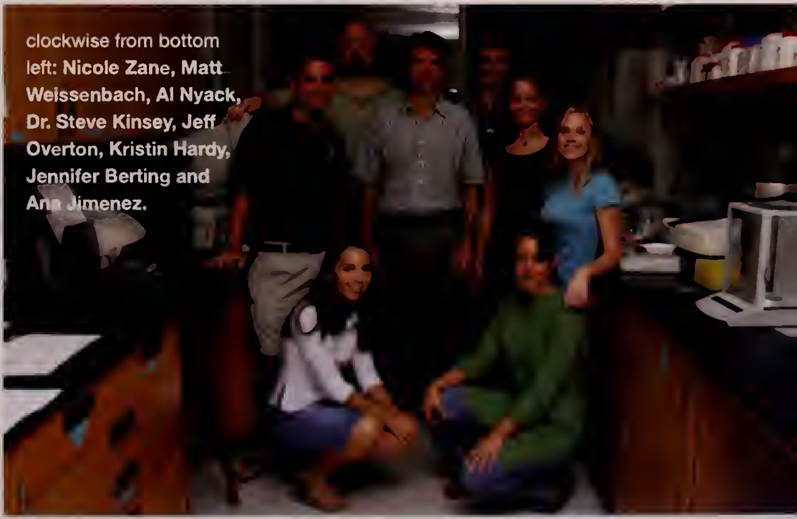
Muscle Diversity in Marine Animals

To understand how properties of living cells, such as molecular motion, impact cell and organism function, we need to know the rules that govern cellular design. That is, why are cells built in the way that they are? And how might environmental factors and/or the presence of disease alter cellular design and function? August Krogh was a famous physiologist who developed the premise that for every biological question, there is an ideal organism for study. There-

The ultimate goal of our research is to be able to predict how cells will respond to different conditions. To accomplish this, we need mathematical simulation models of reaction-diffusion processes in cells.

Undergraduate students in our lab work side-by-side with graduate students and doctoral (Ph.D.) candidates.





clockwise from bottom left: **Nicole Zane, Matt Weissenbach, Al Nyack, Dr. Steve Kinsey, Jeff Overton, Kristin Hardy, Jennifer Berting and Ana Jimenez.**

fore, in order to find answers to these questions, we apply "the August Krogh Principle," and we study marine animals.

Marine animals offer a tremendous diversity of muscle form. Studying the variety of muscle types in marine animals provides clues as to the diverse ways nature has solved problems common to all organisms. Since our research interest is molecular movement, it makes sense to examine cells where the movement of molecules is expected to be an important component of metabolism. And so, we return to the backfin muscle cells of the blue crab. More famous among humans for their culinary appeal, these muscle cells control the paddle-like legs that power the crab's sideways swimming behavior, making them metabolic machines critical to the crab's survival.

In an adult blue crab, the backfin muscle cells can exceed 1/32 inch in diameter and may be more than 1 inch long. That may not sound big, but, because of the random walk nature of diffusion, it takes a molecule 400 times longer to diffuse across a blue crab cell than across a human cell. Since the juvenile crab has cells of more humanly dimensions, we have a natural experiment. Monitoring muscle metabolic and contractile properties as the blue crabs grow (and cellular distances get larger), we can easily observe how cell design and function are impacted by molecular motion.

Of Mice and Men (and Women)

While blue crabs and other marine organisms can tell us a great deal about some of the basic rules that govern cell design, our ultimate goal is to be able to apply these rules to human physiology and health. To observe a closer parallel of human physiology, we also examine molecular motion in mice, the most studied animals in biomedical research.

Here, we take advantage of a genetic model of exercise performance first developed at UNCW by Dr. R. Dale McCall of the department of anthropology. Dr. McCall and his students discovered that in certain strains of mice, only two genes were principally responsible for dramatic differences in the capacity for endurance exercise. Significantly, these studies were conducted under conditions of simulated high altitude, where oxygen availability is drastically reduced and intake compromised.

Since poor oxygen supply is associated with many diseases, including heart disease, this research potentially has broad applications and benefits for human health and performance. Our reaction-diffusion analyses are very useful and applicable in understanding how oxygen gets from the atmosphere to the inside of the muscle cells where it can be used to generate energy. The work of Dr. McCall and his students is, therefore, highly relevant to our investigations.

Putting It All Together

The ultimate goal of our research is to be able to predict how cells will respond to different conditions. To accomplish this, we need mathematical simulation models of reaction-diffusion processes in cells. Our lab at UNCW is fortunate to have received grants from the National Science Foundation to work collaboratively with Dr. Bruce Locke of Florida State University's department of chemical and biomedical engineering to develop these models.

Dr. Locke and his students work with my students and me to develop computer models of the muscle cells that we study to compare measured data to theoretical predictions. If experiments agree with predictions, that probably means we have a good understanding of the metabolic process under examination. We have collaborated with Dr. Locke's lab for several years, and together we have been able to advance our research at both of our institutions and address questions that neither group could have done alone.

Our understanding of how metabolism works in living cells continues to grow, and we are frequently surprised by our findings. At times, those surprises have caused us to discard some dearly held hypotheses. It is these surprises, however, that force us to take up new paths that may lead to greater advances in the field. Finally, perhaps our greatest contribution to society is the ever-growing number of highly scientifically and technically trained students whom we graduate – their contributions when they leave UNCW are also products of our research.

FOR FURTHER READING OR RESEARCH ON THIS TOPIC:

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Kaleidoscope

> After a certain high level of technical skill is achieved, science and art tend to coalesce in aesthetics, plasticity and form. The greatest scientists are always artists, as well.
>
> — ALBERT EINSTEIN

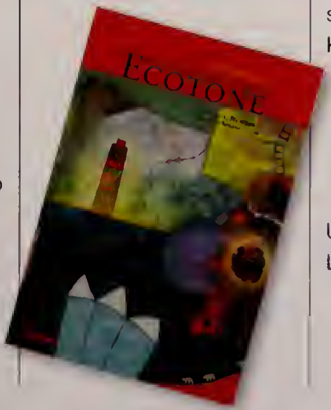
Music Milestone

The department of music, chaired by **Dr. Frank Bongiorno**, received a National Endowment for the Arts (NEA) Summer Schools in the Arts Initiative $30,000 award. As a result of the grant – written and administered by assistant professor and assistant chair of music, **Daniel Johnson** – UNCW's 2005 Summer Music Program enjoyed unprecedented enrollment and success. More than 100 students from ages 12 to 18 presented 12 public concerts with combined audiences of more than 1,000 people. Designed for middle and high school students with prior musical experience, week-long sessions focused on jazz studies, classical piano and concert band. Music instruction was provided six days per week, eight hours per day for three weeks culminating each week in concerts and recitals that demonstrated students' achievements and showcased participant guest artists and music workshop faculty.

Ecotone: Notes from the Rims of Meaning

Conceived by UNCW creative writing graduate students and UNCW professor of creative writing **David Gessner**, *Ecotone* is a national journal published twice a year by the creative writing department and features the work of such nationally prominent writers as Mark Doty, Wendell Berry and Philip Levine. *Ecotone* publishes writing from the wider perspectives. Just as biological ecotones are areas of great species diversity and biological density, so literary ecotones are compelling settings and spaces where words yield new associations, diverse connections and multidimensional images.

Ecotone is currently preparing its second issue and accepting submissions for its third.



Lou Buttino Is New Chair of Film Studies

Dr. Louis F. Buttino, award-winning writer, director and producer of documentary films, member of the advisory board of the International Documentary Association and winner of several university scholarly and teaching honors is the new chair of the film studies department.

Buttino involves students in his work whenever possible. "I believe that mentoring, the age-old process of going from apprenticeship to mastery is a process that engages the whole student, not just their intellect or skill base and is the highest form of teaching," Buttino says.

The North Carolina premiere of Buttino's most recent documentary, *Broken Brotherhood: Vietnam and the Boys from Colgate*, screened November 11 at Kenan Auditorium on the UNCW campus. *Broken Brotherhood: Vietnam and the Boys from Colgate* is available in DVD on loan from the UNCW William Randall Library.

DRAWING BY ELLIS FURST

Love Letters: Betsy Palmer and Pat Hingle Team Up To Raise Money for UNCW Cultural Arts Building Valentine's Day 2005

A. R. Gurney's play, *Love Letters*, is a favorite of actress Betsy Palmer's because of its loveable characters, and its affable and complex male lead is a natural role for Pat Hingle, well-known actor of theater, television and films. Palmer's and Hingle's performance in *Love Letters* was a true hit for their audience, for the Wilmington community and for patrons of the university.

Palmer came to Wilmington at the invitation of Hingle, a supporter of the arts throughout his adopted North Carolina and at UNCW in particular. Palmer, who enjoys performing for fund-raising initiatives supporting the arts, was eager to help raise funds for the new UNCW Cultural Arts Building. "Betsy Palmer's and Pat Hingle's heartfelt performances gave the audience an intimate, memorable experience in this charming historic theatre," said Don Furst, chair of a then-combined department of art and theatre. The play was held at City Stage in downtown Wilmington.

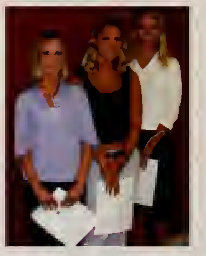
Paul Castagno Builds New Independent Theatre Program

Dr. Paul Castagno brings to UNCW's new independent theatre program outstanding credentials, extensive administrative experience and zeal.

"What brought me here from Ohio University," Castagno said, "was the amazing spirit of UNCW, the support at all levels of administration, the synergy I felt with this faculty, and my strong feeling that this could be the dream of a lifetime – building a great department from ground level footprint upward to the sky."

A new Cultural Arts Building will also house the departments of music, and art and art history; it will provide state-of-the-art performance facilities, new rehearsal rooms, art studios and gallery space. Castagno and the other department chairs visit the site regularly.

Communication Studies Receives New Scholarship



Stephanie Worley, Melissa Freimark and Amanda Reese

Communication studies' UNCW Advertising Chapter (UAC), affiliated with the American Advertising Federation and advised by professor **Hana S. Noor Al-Deen**, received a scholarship gift of $2,750 from the Advertising Women of New York (AWNY). Three UAC recipients were named: **Melissa Freimark '06**, marketing, Cameron School of Business; **Amanda Reese '06**, communication studies, College of Arts and Sciences; and **Stephanie Worley '06**, communication studies, College of Arts and Sciences.

Gerontology Program on the Move

While gerontology courses will remain interdisciplinary, the program has moved. Now housed in the department of health and applied human sciences, gerontology is proceeding with plans for undergraduate degree programs, as well as exploring a professional master's degree program.

Political Science Students Win Noteworthy Achievement

Erin Diener, Jeff Rose and Jenny Payne

At the fall 2005 Southeastern Public Administration Conference in Little Rock, Ark., Master of Public Administration (MPA) students, **Erin Diener**, **Jeffery Rose** and **Jennifer Payne**, won the Kline Best Student Paper Award. The conference represented outstanding MPA programs from throughout the region.

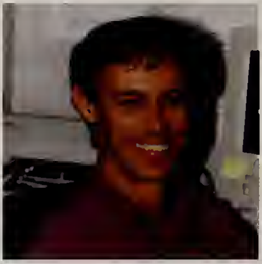
Master of Social Work Serves the Region

The first students to enter the Master of Social Work (MSW) program arrived for the fall 2005 semester. The inclusion of a strengths perspective curriculum places the new program among the most forward-looking in the nation. Students will learn to help clients to identify their strengths and abilities. From proven strengths, patterns of success can be modeled that empower clients to advance toward attainable goals. This approach, currently promoted by the state's mental health agencies, is exceptional within graduate social work education.

Sociology and Criminal Justice Plan Graduate Degree Program

A new graduate program in the department of sociology and criminal justice will prepare students to address large scale social problems with experienced-based training, offering data-driven, tested solutions to guide social policy and decision making. Planning for this program is being supported by funding administered by the Council of Graduate Schools (CGS). Support for three other initiatives at UNCW, the implementation of the Master of Science in computer science and information systems, exploration of proposed programs in gerontology, and a proposed concentration in applied behavioral analysis in psychology were included in the Alfred P. Sloan Foundation and Ford Foundation funding.

Professor of Biology David E. Padgett: A Life's Work



Voracious watermolds clean landscapes and seascapes of dead fish and rotting vegetation. However, certain types of watermolds or aquatic fungi can also kill foodstuffs hungry populations desperately need: crayfish, shrimp and salmon, and sometimes entire estuarine fish populations, as well as crops such as sugar beets and peas. These losses cause economic disruption and in extreme cases, famine.

Professor of biology and marine biology **David E. Padgett** has spent his entire career, beginning in the 1960s as an undergraduate at Duke University, studying watermolds or *saprolegniaceae*, their classification and identification.

Now Padget's life and work will culminate in a soon to-be-published complete reference for the classification and identification of watermolds. The book, co-authored by retired professors T.W. Johnson Jr. of Duke University and R.L. Seymour of Ohio State University, is titled *Biology and Systematics of the Saprolegniaceae* and is expected out in January 2006. A comprehensive scientific opus of 50 chapters and 1,283 pages, the volume summarizes all published scientific literature dating from 1760 on this group of organisms.

For the first time, scientists and researchers will have a comprehensive source from which to identify watermolds – those that augment nature's regenerative processes as well as those that may be destructive to vital food supplies and other ecologically significant activities.

Chemistry Stats Continue To Climb Higher

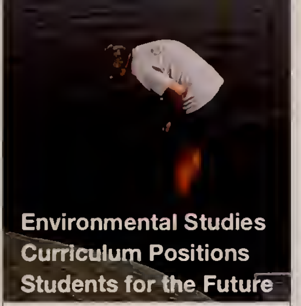
Chemical & Engineering News, weekly news magazine from the chemical, life sciences and laboratory worlds of science, published statistics for the past academic year on the number of American Chemical Society (ACS) certified Bachelor of Science graduates in the nation. UNCW's department of chemistry and biochemistry was 20th in the nation in producing ACS certified chemists and third in the state of North Carolina, behind UNC Chapel Hill and NC State University. For the same year, 2003-04, UNCW was second only to UNC Chapel Hill in the number of ACS certified masters degrees awarded. "These successes are a direct result of our faculty's outstanding efforts in mentoring and inspiring students," chair of the department, **Jimmy Reeves** said.

A New Building for Computer Science

The new Computer Information Systems Building, scheduled for completion in the fall 2006, will jointly house the department of computer science, College of Arts and Sciences, and information systems and operations management in the Cameron School of Business. Students will benefit from multidisciplinary, hands-on laboratories, state-of-the-art dynamically re-configurable research and instruction spaces, student "sandboxes" to facilitate team-based, collaborative learning and a hands-on exploration laboratory showcasing emerging technologies.

Earth Sciences Certificate in Geographic Information Science

The rapidly growing field of geographic information service is an expanding worldwide job market. In 2003, the department of earth sciences began its undergraduate geographic information service certificate for students who seek documented expertise in a range of geographic techniques. The certification provides students an edge in seeking employment. Program emphases include: Geographic Information Systems, remote sensing image processing and analysis, statistics from a geographic perspective, urban and regional planning, and historic preservation planning.



Environmental Studies Curriculum Positions Students for the Future

UNCW's environmental studies (EVS) department is the largest and most diverse EVS program in the state, providing a wide array of experiential learning opportunities for students through internships, practicums, directed individual studies and honors projects. Students work with UNCW faculty on research projects such as Cape Fear River Watch, with governmental agencies such as the U.S. Corps of Engineers and with private companies such as GE and Progress Energy. These types of hands-on learning experiences lead to career enhancing opportunities for students both academically and professionally.

Professor's Nuclear Physics Research Involves Undergraduates

During each of the last two summers, physics professor **Timothy Black** of the department of physics and physical oceanography has employed one or more UNCW undergraduates to assist with work supported by a National Science Foundation (NSF) grant. In collaboration with researchers at Tulane University and the University of Missouri, Columbia, the research uses interferometric techniques to carry out precision measurements of the neutron-electron scattering amplitude and the spin-dependent neutron-^{3}He scattering length.

Black's work has been recognized internationally for its importance in elucidating the nature of few-nucleon forces. One of a select group invited to address the Fourth International Workshop on Chiral Dynamics in 2003, Black received another invitation to speak at the Third Asia-Pacific Conference on Few-Body Problems in Physics Nakhon Ratchasima, Thailand, July 2005.

Math Professor Earns Two Teaching Awards

Russell L. Herman

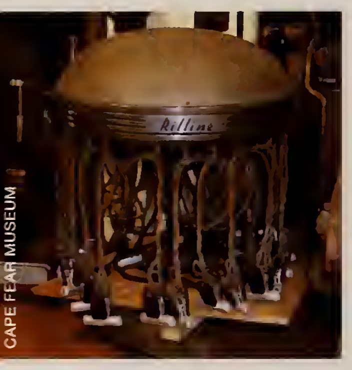
Mathematics and statistics associate professor **Russell L. Herman** received two teaching awards, the 2005 Chancellor's Teaching Excellence Award and the 2005 Distinguished Teaching Professorship Award.

Physics and Physical Oceanography To Offer Students Joint Degree

UNCW's physics and physical oceanography department and the department of electrical engineering at NC State University are planning a joint five-year degree. Chair of the department of physics and physical oceanography, **Dr. Curt Moyer** and faculty, in cooperation with **Dr. Ken Diehl**, director of the pre-engineering program with NC State at UNCW, hope to see the new program in place for fall 2006. Students who successfully complete the program would receive a Bachelor of Science degree in physics from UNCW and a Bachelor of Science degree in electrical engineering from NC State University.

Camp Special Time Is a Very Special Place

Under the direction of health and applied human sciences associate professor **Danny E. Johnson**, therapeutic recreation students plan and conduct Camp Special Time, three weekend camps per year at Camp Lejeune for the disabled children of active-duty Marines. Camp Special Time offers a chance to have fun at a camp especially adapted to meet the needs and strengths of these children. Many of the students' disabilities are severe, and, for some, it is the first time they have ever been away from their families. The campers not only benefit from student- and faculty-designed recreational therapies and stimulating interactive social activities but also from attaining a sense of independence. Camp Special Time also provides a much needed respite for families.



CAPE FEAR MUSEUM

Among the artifacts researched by UNCW students for Cape Fear Museum is this permanent wave machine, used to coif Wilmington women in the 1930s.

A New Collaboration: Public History Students and the Cape Fear Museum

Objects donated to the Cape Fear Museum are full of history. But donations cannot speak for themselves and sometimes their significance begs explanation. Budget restraints that mean too few experts on staff often prevent the museum from promptly researching many of the donated objects and telling their stories. Consequently, objects often lie out of sight in the museum's collections rooms waiting to be researched, evaluated and sourced.

A new collaboration between the UNCW department of history and the museum is providing an opportunity to bring these objects to light sooner as it gives UNCW history students valuable professional experience and training. UNCW graduate public history students work to research objects from the museum's collections to identify, catalogue, find and tell their stories. Articulating the stories behind these objects often reveals exciting connections.

Brownie's Beauty Styles was located in the home of Gladys E. Brown at 809 Chestnut St. in Wilmington. Brown retired from hairdressing at 93 years of age. After her death in 2000, her son donated the furniture and the equipment from the salon to the Cape Fear Museum, including a permanent-wave machine. The machine, circa 1935, appears to be an excellent example of the original permanent-wave machine invented by African-American business woman Marjorie Joyner. Joyner's idea to use pot roast rods (a popular way to cook pot roast in the early 1900s) to curl hair for both white and black women led to her receiving the first patent for a permanent-wave machine in 1928 with African-American entrepreneur Madame C.J. Walker, assignor. UNCW students will further research the machine at the museum to verify its connection to the original Joyner machine.

Rediscovering objects and their relevance to history brings these and other stories to life for everyone, deepening the community's sense of its rich, regional history.

— details provided by Barbara Rowe, Curator, Cape Fear Museum

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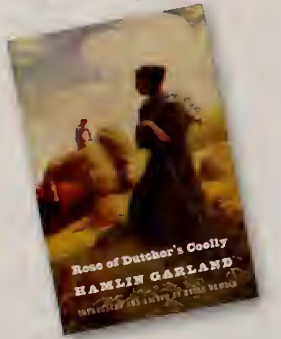
Dr. Keith Newlin, English, Awarded NEH Fellowship



Keith Newlin, professor of English at UNCW, was awarded a National Endowment for the Humanities fellowship to complete a biography of Hamlin Garland (1860-1940) novelist, short-story writer, poet, essayist and memoirist. Newlin's biography is under contract with the University of Nebraska Press, which has also issued the following two reprints of Garland's books with introductions by Newlin: *Rose of Dutcher's Coolly* (1895) and a collection of stories, *The Book of the American Indian* (1923).

Professional Writing Program Creates Powerful Learning Experiences

Service and outreach are integral to the English department's professional writing program. This year, professional writing student interns contributed more than 7,560 hours of work to the community.

Committed to interdisciplinary work, the program provides students with a solid liberal arts platform to inform their writing.

Philosophy and Religion

Assistant professor **Diana Pasulka** organized a two-day conference to explore the role of women in early and contemporary Christianity. Amy-Jill Levine, the E. Rhodes and Leona B. Carpenter Professor of New Testament Studies at Vanderbilt University, delivered the opening evening B. Frank Hall lecture, *Women and Jesus*, to more than 350 people at Kenan Auditorium.

Other successful community lectures included *Animal Rights and Environmental Wrongs*, co-sponsored with the department of environmental studies, given by Dr. Tom Regan of NC State University, an internationally known animal rights theorist and activist; David Hume's *Critique of Religious Belief* by Dr. Timothy Costelloe, College of William and Mary; *The Five Buddha Families* by Gangteng Rinpoche, advisor to the imperial court of Bhutan; *Thoreau's Virtue* by **Dr. Paul Medeiros**, UNCW; and *Thomas Hobbes and the Problem of Double Vision* by Dr. Eric Brandon, Cape Fear Community College.

Noteworthy Student Achievements in Philosophy and Religion

Matt Sayball '06 won best undergraduate essay, *A Discourse on Mary*, on the knowledge argument against physicalism at the NC Philosophical Society meeting, Duke University, February 2005. **Lauren Goodman '05** received the Teal Award for her presentation *WWII through the Eyes of Children*, American Academy of Religion Conference, Minnesota, March 2005. It was published in *ARTS: A Journal of Religion in the Arts*.

German Studies

Raymond Burt, associate provost, and assistant professor of German **Oliver Speck** have developed an innovative German studies major in the department of foreign languages and literatures that breaks boundaries technologically, is interdisciplinary, and delivers the bonus of German language acquisition.

Courses related to German-speaking cultures are taught in the German language at progressively higher levels of intensity in both the traditional UNCW on-campus classroom and via live video-link to classrooms at other UNC system universities. Outcomes indicate that over the span of their coursework UNCW German studies students are attaining the same level of language proficiency – or higher – as their counterparts in other language majors.

Liberal Studies

Current enrollment in the graduate liberal studies program is 125 students, making graduate liberal studies the largest graduate program at UNCW. The program, which offers evening classes for students who wish to augment undergraduate specializations with a more broadly based education, has grown to include an outreach program in Onslow County and a post-master's certificate.

Thank you!

Three years ago, the College of Arts and Sciences began an evaluation of the potential of its Excellence Fund, unrestricted annual gifts given by alumni to advance and expand educational opportunities. It became quickly apparent that the Excellence Fund should be a primary resource for fulfilling the college's educational mission.

The Excellence Fund provides immediately accessible funding to faculty and students for instruction, for scholarship, for worthy projects and for service initiatives not covered by other sources of funding. Additionally, many agencies and institutions that measure university performance count alumni participation in annual giving campaigns like the Excellence Fund phonathon as a key indicator of institutional quality and strength.

Because of the success of the 2005 Excellence Fund campaign, the college will be able to:

- assure faculty participation in important state and national meetings and conferences promoting service-learning, individual research and regional as well as national collaborative educational efforts;
- bring leaders, innovators, leading scholars, promising new authors and artists to UNCW for lectures, symposiums and colloquiums that are open to the public as well as the university community;
- support educational objectives where state funding falls short;
- support student travel for educational purposes;
- support international networking;
- provide instructional equipment and technology needed but not covered by state budget allocations.

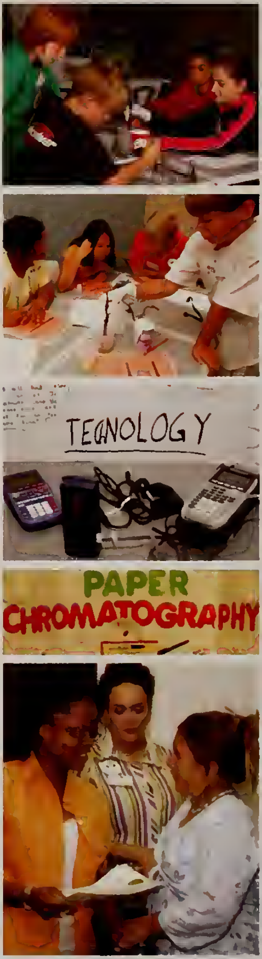
Your annual participation in the College of Arts and Sciences Annual Excellence Fund advances the educational mission of the College of Arts and Sciences and shows the spirit and sense of community that sets UNCW apart!

Access + Interactive Fun =
Success in Math and Science

Denise Terry

Designed to create opportunities for middle school youth of all academic, ethnic, linguistic and income backgrounds in Southeastern North Carolina, UNCW's week-long Junior Seahawk Academy, held during the summer on the campus, seeks to engage and encourage all students to explore math, science and technology. The innovative project was created and led by UNCW assistant professor of mathematics Denise Terry, with support from Dr. Wei Feng, chair of the Department of Mathematics and Statistics.

While there are many summer programs that meet the needs of students interested in these subjects, most programs are well outside the financial reach of many families. Others are structured primarily for advanced or high-achieving students. Junior Seahawk Academy was designed to be affordable and accessible to all students who want to participate in structured, interactive, technologically advanced yet fun activities aligned with the North Carolina Standard Course of Study for Middle School mathematics and science. To achieve these objectives, in addition to advertising in all county public schools, the program was intensely promoted to groups such as women, racial and ethnic minorities and students from low-income groups. Teachers in public schools were asked to distribute information to all students regardless of past academic performance, attitude or aptitude. Application packets were given to the New Hanover County Housing Authority, Catholic Youth and Hispanic Ministries, the New Hanover County English as a Second Language Office, as well as area churches.



With an original cap of 35 students, the camp enrolled twice that number. A highlight of the week-long program was an interactive exchange with NASA via satellite technology. Students conducted an experiment on gravity with the NASA educators using household materials such as milk jugs and cereal. Staff included three high school volunteers, four undergraduate and two graduate student volunteers, two UNCW and one NC A&T faculty. The program was so successful that New Hanover County teachers are asking Junior Seahawk Academy at UNCW to consider providing instruction on weekends and/or teacher workdays during the school year.

UNCW

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